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Outlook for Gains in Longevity After Age 60*

Since 1929-31, the expectation of life at age 60 has increased one year among white men and about three years among white women. These increments are attributable largely to decreases in the mortality from the infectious diseases—notably tuberculosis and pneumonia—and accidents. Some further gains will undoubtedly accrue from continuing advances in the control of the infections, but for the most part future gains will depend upon reductions in mortality from the degenerative diseases. The table on page 2 shows the number of years that would be added to the present expectation of life of white persons at the older ages if the mortality rates from certain important causes of death were to decrease by specified percentages. Reductions of 10 to 20 percent have been considered by some to be within reach in the decades immediately ahead; decreases of 50 percent represent goals which may be attained only by future generations.

The cardiovascular-renal diseases, because of the magnitude of their death rates, are the greatest potential source for increases in the expectation of life at the older ages. Even a 10 percent reduction in mortality from these conditions would add about two thirds of a year of life to people in their 60's. If 20 percent of these deaths could be eliminated, the gains would amount to about 1⅓ years. In the latter case, the expectation of life for a white male at age 60 would increase from 15.7 to 17.1 years; for a white female the figure would rise from 19.2 to 20.6 years.

The cardiovascular-renal diseases include a large number of conditions of specific and of unknown origin. Several of the components, such as heart diseases of rheumatic and infectious origin, vascular lesions affecting the central nervous system, general arteriosclerosis, and nephritis have recorded decreases in mortality for a number of years, and some further reductions may be expected. It is also not unreasonable to expect that some prog-

*This is the last of three articles on mortality and longevity among older people. The previous articles, "Trends in Survival at the Older Ages" and "Causes of Death in Later Life," appeared in the September and October issues, respectively.

ress may be made in the prevention and treatment of coronary artery disease; the increase in the mortality from this disease has been the major factor in the recent trends for the cardiovascular-renal diseases as a whole.

Malignant neoplasms rank second as a cause of death at the older ages. Nevertheless, even a 20 percent reduction in the mortality from this cause would add less than

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YEARS OF LIFE THAT WOULD BE GAINED AFTER AGE 60 BY SPECIFIED REDUCTIONS IN MORTALITY

White Population by Sex, United States, 1958

Percent Reduction in Cause of Death	White Male			White Female		
	Age 60	65	70	Age 60	65	70
	Expectation of Life in 1958					
	15.7	12.7	10.1	19.2	15.4	12.0
	Years of Life Gained					
Cardiovascular-renal diseases						
10 percent	0.7	0.6	0.6	0.7	0.7	0.6
20 percent	1.4	1.3	1.2	1.4	1.4	1.3
50 percent	4.2	3.9	3.7	4.3	4.2	4.0
Malignant neoplasms						
10 percent	0.2	0.1	0.1	0.2	0.1	0.1
20 percent	0.3	0.2	0.2	0.3	0.3	0.2
50 percent	0.8	0.7	0.6	0.8	0.6	0.5
Accidents						
10 percent	*	*	*	0.1	*	0.1
20 percent	0.1	*	*	0.1	0.1	0.1
50 percent	0.1	0.1	0.1	0.2	0.1	0.2
Pneumonia and influenza						
10 percent	*	*	*	0.1	*	0.1
20 percent	0.1	*	*	0.1	0.1	0.1
50 percent	0.2	0.1	0.1	0.2	0.1	0.2
All other causes						
10 percent	0.1	0.1	0.1	0.1	0.1	0.1
20 percent	0.3	0.2	0.2	0.2	0.2	0.2
50 percent	0.7	0.5	0.5	0.5	0.5	0.4

*Less than 0.05 years.

Source: Computed by the Statistical Bureau of the Metropolitan Life Insurance Company from data in reports by the National Office of Vital Statistics.

one third of a year to the expectation of life at age 60; a 50 percent reduction, however, would add 0.8 years at this age and at least 0.5 years at age 70. Marked reductions would depend upon the development of more effective means than are now available for the prevention and treatment of malignancies. This is particularly true with regard to respiratory cancer among males, the recorded mortality from which has greatly increased in recent years.

Future reductions in mortality from any of the other causes could have only a minor effect on longevity after age 60. Thus, even with a 50 percent decrease in accident fatalities among older people, the expectation of life at age 60 would be increased by only 0.1 year for white men and 0.2 years for the women. A gain of only a small fraction of a year of life would result from a similar reduction in mortality from pneumonia and influenza, diabetes mellitus, tuberculosis, cirrhosis of the liver, or ulcers. It is significant, however, that a 50 percent reduction in mortality from all causes other than the cardiovascular-renal diseases and malignancies—which is within the realm of possibility—would effect a gain in longevity greater than that from a like reduction in the death rate from malignant neoplasms. For men, moreover, such gain would be equivalent to the total improvement in longevity actually recorded between 1929-31 and 1958.

The future is necessarily a matter for conjecture, but there is every reason to believe that further gains in longevity are in prospect at the older ages. In the future, as in the past, the changes are likely to occur in spurts as progress is made first against one disease and then against another. Thus, further gains will probably be the result of decreases in varying degree from many causes of death.

Current Morbidity and Mortality From Diabetes

THERE are about 1,500,000 known cases of diabetes in the United States, or 9 per 1,000 population, according to data derived from the U. S. National Health Survey covering the two-year period July 1957-June 1959. This estimate includes only previously diagnosed cases known to the member of the household who furnished the information to the interviewer. Even the estimate for known diabetics may be an understatement, inasmuch as the Survey did not include the institutionalized population, which, because of its relatively high average age, has a greater proportion of diabetics than the population living in households.

The number of diabetics in the United States has grown in the past two decades, largely because of the increase in population—particularly at the older ages—and the in-

creased longevity of diabetics. Currently, they number more than twice the 660,000 estimated for 1937 from the earlier National Health Survey. The current prevalence rate of 9 per 1,000 is nearly double that estimated for the earlier year, even though the latter included an upward adjustment for underreporting.

The new Survey indicates that known cases of diabetes are about 1⅓ times as frequent among females as among males for all ages combined. Males, however, have somewhat higher prevalence rates under age 45. In both sexes, the large majority of diabetics are past mid-life; more than 80 percent are 45 years of age or older, and nearly 40 percent are at ages 65 and over.

Most diabetics today carry on normal activity. In the current National Health Survey, 3 out of every 4 diabetics were reported to have no chronic limitation of activity because of the disease, although a high proportion of the cases are among older people. Moreover, 85 percent of the diabetics were free from disability requiring confinement to bed on account of the disease.

Mortality statistics are much less adequate than prevalence figures in defining the magnitude of the diabetes problem. In 1959, only about 28,000 deaths were ascribed to diabetes, which is scarcely half of all the deaths occurring among diabetics. The disparity between the number of deaths ascribed to diabetes and the total number occurring among diabetics is due primarily to the high proportion of deaths among diabetics allocated to the chronic diseases, particularly of the cardiovascular system. The reported death rate from diabetes in the United States is now only 16 per 100,000 population, and in Canada only 11 per 100,000. The lower rate for Canada is accounted for, in part, by its smaller proportion of older people, and, in part, by its lower age-specific rates. Morbidity data also indicate that diabetes is less prevalent in Canada than in the United States.

How high a proportion of diabetics succumb to the cardiovascular-renal diseases is indicated by an analysis of the causes of death among diabetic patients of the Joslin Clinic in Boston; the facts for the four-year period 1956-59 are summarized in the table on page 5. Three fourths of all the deaths among these patients were due to the cardiovascular-renal diseases, the bulk of them resulting from coronary artery disease. Another major component of the mortality from this group of diseases is nephritis, which includes diabetic nephropathy, a severe systemic condition accounting for many deaths among people with diabetes of long duration. It is noteworthy that diabetic coma was responsible for less than 1 percent of the deaths in this experience.

A follow-up study of the diabetic patients of the Joslin Clinic shows

their comparatively favorable survivorship record. Illustrative is the experience of patients first examined in the period 1940-49 within a year of the onset of their disease. Of those 45-59 years of age when examined, about 75 percent were alive at the end of 10 years; for those aged 60-74 when first observed, the proportion was 45 percent. In the general population, the 10-year survivorship rate for persons in the age group 45-59 was nearly 85 percent, and somewhat over 60 percent for those aged 60-74 years. The survivorship rates for the diabetic patients who had had the disease for more than a year prior to being examined were appreciably lower than those for patients observed within the first year, indicating the importance of early diagnosis and treatment.

In middle and late life, the death rate among diabetics continues to be at least twice that among nondiabetics. There is need for further research on the cause of diabetes, for more effective means of treating the disease, and for measures to prevent or postpone its onset. One effective way to reduce the incidence of the disease is to prevent overweight. Many studies of insured lives, including the Build and Blood Pressure Study, 1959,

THE CAUSES OF DEATH AMONG DIABETICS DYING IN 1956-59*

Experience of Joslin Clinic, Boston, Mass.

Cause of Death	Number of Deaths	Percent of All Causes
All Causes	2250	100.0
Primary coma	16	0.7
Cardiovascular-renal diseases	1716	76.3
Heart disease, total	1119	49.7
Coronary artery disease	792	35.2
Nephritis	234	10.4
Diabetic nephropathy	145	6.4
Cerebral vascular disease	255	11.3
Gangrene	58	2.6
Arteriosclerosis and hypertension	30	1.3
Other	20	0.9
Pneumonia and respiratory diseases	51	2.3
Other infections	63	2.8
Cancer	245	10.9
Tuberculosis	8	0.4
Accidents	45	2.0
Other and unknown diseases	106	4.7

*Deaths reported through January 29, 1960.

of the Society of Actuaries, show that the mortality from diabetes is significantly higher among overweights than among people of lesser weight, and increases with the degree of overweight. Continued efforts to detect the disease early can be directed most profitably to overweights past 40 years of age—particularly women—and to those with a family history of the disease.

Most Deaths Now Occur in Hospitals

An increasing number and proportion of the deaths in the United States are occurring in hospitals, a reflection of the growing use being made of these institutions in the diagnosis and treatment of serious illness. The number of deaths in hospitals increased from about 644,000 in 1949 to more than 877,000 in 1958; the proportion that these deaths were of the national total rose from 45 to 53 percent.

The geographic divisions of the country vary appreciably with respect to the proportion of deaths occurring in hospitals. In 1958 such deaths were relatively most frequent in the Mountain and Pacific Divisions, where they accounted for slightly more than 57 percent of all the deaths in those areas. The proportion was lowest in the East South Central Division, but even there more than two fifths of the deaths took place in hospitals. The record for individual States shows that in only one—Mississippi—was the figure as low as 37 percent. On the other hand, in six States — North Dakota, South Dakota, Wyoming, Montana, Nevada, and Colorado — and the District of Columbia the proportion was at least 60 percent.

Many more deaths occur in general hospitals than in all other types of hospitals combined. As the table on page 7 indicates, 9 out of every 10 deaths occurring in hospitals, and not far from half of all the deaths in the United States, take place in general hospitals. The remaining tenth of the deaths occur in nervous and mental hospitals or in other special hospitals, such as maternity, tuberculosis, and chronic disease hospitals.

A large proportion of the deaths from each of the major causes take place in hospitals. Thus, in 1958 about 411,500 deaths from the cardiovascular-renal diseases, or 45 percent of all the deaths from these conditions in the United States, occurred in hospitals. The proportion is even higher for deaths from cancer (malignant neoplasms). For the malignancies as a group, it was slightly over 60 percent; for cancer of the respiratory system it was 66 percent, for lymphosarcoma 74 percent, and for leukemia and aleukemia it exceeded 80 percent. About 64,000 deaths from "certain diseases of early infancy" (largely birth injuries, postnatal

PROPORTION OF DEATHS OCCURRING IN HOSPITALS

Selected Causes. United States, 1958

Cause of Death	Total Deaths	Deaths in Hospitals		Percent in		
		Number	Percent	General Hospital	Special Hospitals	
					Nervous and Mental	Other*
All Causes	1,647,886	877,174	53.2	47.6	3.5	2.1
Tuberculosis, all forms	12,361	9,592	77.6	37.9	6.4	33.3
Syphilis and its sequelae	3,469	2,341	67.5	49.1	16.4	2.0
Communicable diseases of childhood†	815	503	61.7	55.7	1.5	4.5
Meningococcal infections	746	644	86.3	79.1	0.5	6.7
Acute poliomyelitis	255	228	89.4	77.6	—	11.8
Malignant neoplasms	254,426	155,760	61.2	56.5	1.3	3.4
Buccal cavity and pharynx	5,766	3,455	59.9	51.3	2.0	6.6
Digestive organs and peritoneum	88,144	51,613	58.6	54.8	1.4	2.4
Respiratory system	35,423	23,391	66.0	60.2	1.3	4.5
Breast	22,675	12,843	56.6	51.4	1.3	3.9
Genital organs	38,390	21,369	55.7	51.0	1.4	3.3
Urinary organs	12,122	7,628	62.9	58.6	1.3	3.0
Other and unspecified sites	27,978	16,893	60.4	55.4	1.6	3.4
Leukemia and aleukemia	11,980	9,740	81.3	75.0	0.8	5.5
Lymphosarcoma and other neoplasms, etc.	11,948	8,828	73.9	69.0	0.9	4.0
Benign neoplasms	4,961	3,880	78.2	72.1	3.3	2.8
Diabetes mellitus	27,501	16,803	61.1	56.9	2.7	1.5
Major cardiovascular-renal diseases	907,316	411,466	45.3	39.8	4.1	1.4
Diseases of cardiovascular system	893,489	403,101	45.1	39.6	4.2	1.4
Vascular lesions	190,758	97,986	51.4	46.3	3.5	1.6
Diseases of heart	637,246	270,030	42.4	36.9	4.2	1.3
Other	65,485	35,085	53.6	46.2	5.9	1.5
Nephritis	13,827	8,365	60.5	57.0	2.1	1.4
Influenza and pneumonia, except pneumonia of newborn	57,439	34,558	60.2	47.2	10.8	2.2
Ulcer of stomach and duodenum	10,801	9,250	85.6	81.4	2.7	1.5
Appendicitis	1,845	1,714	92.9	89.1	2.2	1.6
Hernia and intestinal obstruction	8,853	7,716	87.2	81.1	4.2	1.9
Gastritis, duodenitis, etc.	7,838	5,893	75.2	70.5	2.5	2.2
Cirrhosis of liver	18,638	14,221	76.3	73.1	1.7	1.5
Deliveries and complications of pregnancy	1,581	1,319	83.4	82.2	0.3	0.9
Congenital malformations	21,411	17,944	83.8	74.7	1.5	7.5
Certain diseases of early infancy	68,960	64,175	93.0	90.2	—	2.8
Accidents	90,604	41,009	45.3	42.9	1.7	0.7
Motor vehicle	36,981	15,918	43.0	42.6	0.1	0.3
Other	53,623	25,091	46.8	43.1	2.8	0.9

*Includes maternal, tuberculosis, chronic, and other special hospitals.
†Measles, scarlet fever, whooping cough, and diphtheria.
Source: National Office of Vital Statistics, *Vital Statistics of the United States 1958.*

asphyxia, and immaturity without further qualification), or more than 90 percent of all deaths from these causes, took place in hospitals. The details for other causes of death are shown in the table.

It is expected that an increasing number of people with terminal illnesses will utilize hospital services as the bed capacity and diagnostic and therapeutic facilities of these institutions expand further. Even now at least 90 percent of the general hospitals in the United States have operating rooms, basal metabolism apparatus, clinical laboratories, electrocardiograph equipment or X-ray diagnostic service. Furthermore, an increasing number of people avail themselves of hospital services through voluntary health insurance. It is estimated by the Health Insurance Council that there are now more than 130,000,000 people in the United States protected against the costs of hospital care—more than twice the number covered only 12 years ago.

Accidents Among Farm Residents

ALTHOUGH fatal accidents among farm residents in the United States have decreased in frequency during the past decade, they were still responsible for about 11,700 deaths in 1959. This number, which included injuries sustained by such residents both on and off the farm, was equivalent to a death rate of 55.3 per 100,000, compared with 51.5 for the whole population of the continental United States. The less favorable record for the farm people reflected their higher mortality from occupational injuries and motor vehicle accidents. It is estimated by the National Safety Council that accidents arising out of and in the course of employment caused approximately 3,400 deaths among farm residents last year, or nearly 30 percent of their entire accident toll—twice the proportion in the population as a whole. Motor vehicle accidents, outranking every other type of mishap, took about 5,300 lives* among farm residents; this was 45 percent of the total, a slightly higher proportion than in the general population. Accidents in and about the farm house resulted in the fatal injury of 2,700 people, while public accidents other than motor vehicle were responsible for the loss of an additional 900 lives.

One aspect of the farm accident problem merits special attention: the fatal injuries occurring on farmland under cultivation and around farm service buildings. Such accidents are responsible for about one fifth of all fatal injuries sustained by farm residents; details regarding accidents of this kind for the years 1957-58, based

*About 600 of these were occupational accidents and are included in both categories.

upon data from the National Office of Vital Statistics, are shown in the accompanying table.

Machinery is the largest single cause of fatal accidents which occur in farm work areas, accounting for nearly 900 deaths a year in the United States. Reflecting the increasing mechanization of farm activities, the loss of life resulting from machinery accidents rose from 28 percent of the total farm accident mortality in 1950 to 36 percent in 1958. Information available from individual States indicates that a very considerable part of the toll from machinery accidents represents deaths sustained in tractor accidents. In Kansas, for example, tractor accidents were responsible for about four fifths of the deaths involving farm machinery during 1955-59. A considerable number of these fatal injuries resulted from tractors overturning while being driven on a steep grade.

One out of every 7 fatal accidental injuries occurring in farm work areas is attributable to drowning. Although ponds, drainage ditches, and other water resources are assets to a farm, they also constitute hazards, particularly for children and adolescents. A study published several years ago by the United States Department of Agriculture showed that 30 percent of the drownings on the farm were among

MORTALITY FROM NONTRANSPORT ACCIDENTS ON THE FARM,* BY TYPE

Continental United States, 1957-58

Type of Accident	Average Annual Number of Deaths			Percent of Total, Both Sexes	Percent Male Deaths of Total
	Both Sexes	Males	Females		
Nontransport—Total	2,405	2,194	211	100	91
Machinery	871	827	44	36	95
Drowning	380	317	63	16	83
Firearms	312	298	14	13	96
Falls	197	175	22	8	89
One level to another	136	130	6	6	96
Blow from falling objects	136	126	10	6	93
Fires and burns by other means	113	94	19	5	83
Accidents caused by animals and insects	98	84	14	4	86
Electric current	81	79	2	3	98
Lightning	44	40	4	2	91
All others	173	154	19	7	89

*Includes land under cultivation and service buildings, but excludes farm homes.

Source of basic data: Reports of the National Office of Vital Statistics.

children under 5 years of age; nearly as high a proportion of the victims were in the age group 5-14, and about 15 percent were 15-19 years. Thus, youngsters under 20 years of age comprised nearly three fourths of the drowning fatalities.

Firearms take about 300 lives a year on cultivated farmland and around farm service buildings. Some of these victims, however, are residents of urban places and other nonfarm areas. Falls, blows from falling objects, and fires and burns by other means each account for more than 100 deaths annually on farms.

Fatal injuries from each type of farm accident are largely concentrated among males, reflecting the fact that they generally do the hazardous tasks around the farm. The mortality from on-the-farm nontransport accidents among males is relatively high at the adolescent ages and highest in later life. In 1957-58 the death rate increased sharply from 11.5 per 100,000 under age 15 to about twice that figure at ages 15-19. It then decreased a little and remained at the level of nearly 20 per 100,000 for ages 20-44. The rate subsequently increased with advance in age, reaching 38.9 per 100,000 at ages 65 and over.

Nonfatal injuries likewise impose a heavy burden on farm residents. Data derived from the U. S. National Health Survey indicate that, in the year ended June 1958, 5,616,000 rural farm residents suffered injuries involving at least one day of restricted activity or medical attendance; this is more than one fourth of the rural farm population. The frequency of such accidents among males is nearly 1½ times that among females; for work accidents alone the ratio is about 4 to 1.

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The following has been published recently, and reprints will be sent upon request.

"Factors in Human Mortality," *The Biology of Aging: American Institute of Biological Sciences Symposium*, No. 6, 1960.

MORTALITY FROM SELECTED CAUSES

Industrial Policyholders, Metropolitan Life Insurance Company

October 1960

Cause of Death	Annual Rate per 100,000 Policyholders*				
	October		Year to Date		
	1960†	1959†	1960†	1959†	1958
All Causes	613.0	650.6	680.6	671.0	668.5
Tuberculosis (all forms)	3.8	6.0	5.6	5.8	6.9
Communicable diseases of childhood	—	—	0.1	0.1	0.2
Acute poliomyelitis	0.2	0.8	0.1	0.2	0.1
Malignant neoplasms	138.0	145.1	143.2	143.0	140.7
Digestive system	45.5	48.0	48.0	48.6	47.2
Respiratory system	19.6	22.0	21.6	21.5	19.8
Diabetes mellitus	14.0	13.9	15.6	15.0	15.6
Diseases of the cardiovascular-renal system	318.2	334.0	362.8	357.4	354.5
Vascular lesions, central nervous system	56.9	63.7	67.7	68.1	66.6
Diseases of heart	234.3	246.3	267.8	263.0	262.5
Chronic rheumatic heart disease	7.9	10.8	10.9	10.9	11.4
Arteriosclerotic and degenerative heart disease	189.1	197.7	215.0	209.0	208.0
Diseases of coronary arteries	109.8	118.3	126.1	124.9	119.1
Hypertension with heart disease	27.4	26.5	29.8	30.9	32.1
Other diseases of heart	9.9	11.2	12.2	12.3	10.9
Nephritis and nephrosis	6.1	6.0	6.9	7.3	7.4
Pneumonia and influenza	14.0	14.3	22.7	18.7	21.0
Complications of pregnancy, childbirth	0.5	1.0	0.6	0.8	0.8
Suicide	6.3	6.9	6.3	6.6	6.2
Homicide	2.9	3.0	2.9	2.8	2.8
Accidents—total	29.2	33.9	32.8	33.7	34.2
Motor vehicle	15.2	16.9	13.9	14.6	14.7
All other causes	85.9	91.7	87.9	86.9	85.5

*These death rates relate to persons insured under Weekly or Monthly premium-paying industrial policies and Monthly premium-paying Ordinary policies for small amounts of insurance.

†Beginning with January 1959, deaths have been classified according to the Seventh Revision of the International List of Causes of Death. Consequently, the death rates for individual causes in 1959 and 1960 are not strictly comparable with those for earlier periods. Rates for 1960 are provisional.

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